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From: Rich Thornton, PE - HDR

Project: Mather Point Phase 2

CC: Doug Emmons – HDR; Denise George - DHM

Date: June 18th, 2009

HDR Job No: 110494

RE: CVIP/Mather Point – Phase 2 Drainage Memo

1.0 Introduction

The proposed Phase 2 site improvements are generally consistent with the site planning assumptions used in the development of the drainage report for the CVIP and Mather Point Visitor Center Expansion project (Phase 1). The Phase 2 site improvements follow the grading and site features used to develop the subbasin boundaries associated with the Phase 1 hydrologic and hydraulic calculations. The exception to this is between the icon feature and Lot D of the Phase 2 improvements. These improvements near Lot D create slight changes to the subbasin delineation and resulting hydrology as described in the following section of this TM.

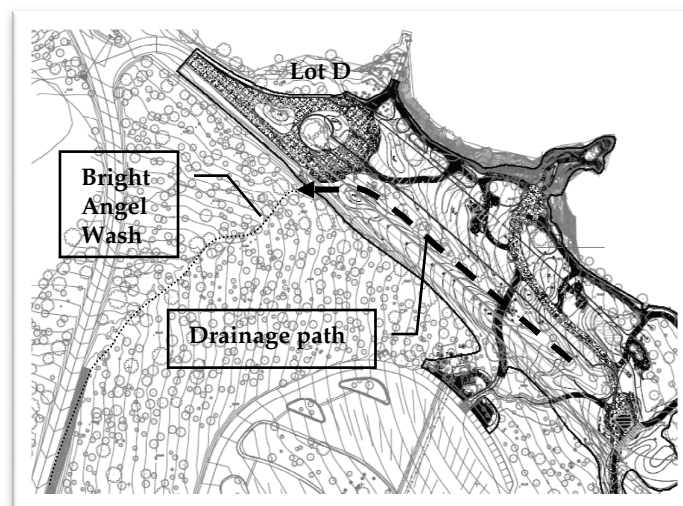


Figure 1 – Phase 2 improvements near Lot D

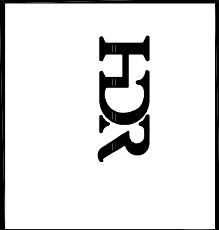
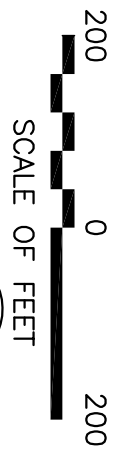
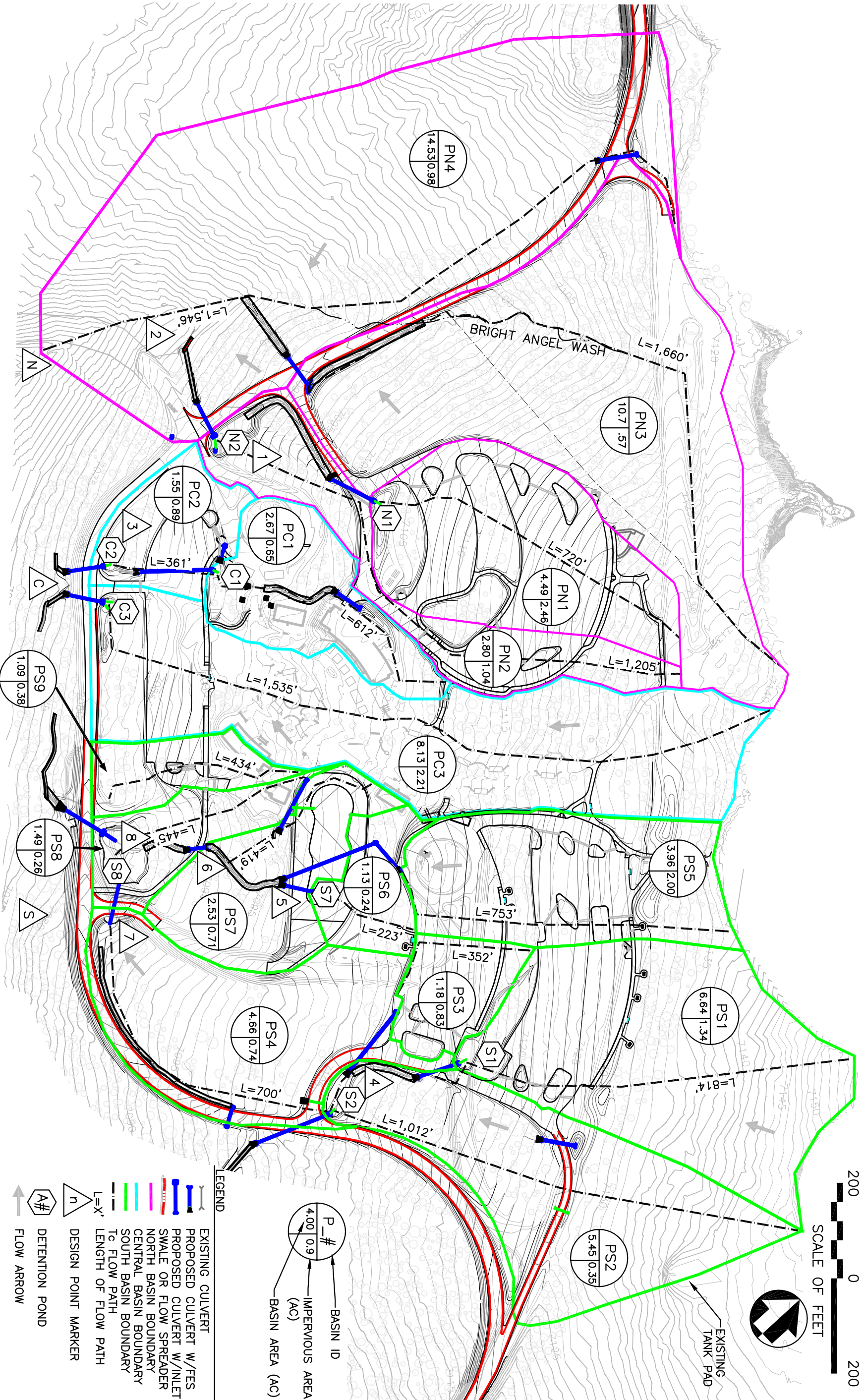
2.0 Phase 2 Drainage Adjustments

The Phase 2 site improvements (shown on Figure 1) remove the existing loop road alignment and parking area adjacent to Mather Point. The proposed site grading creates a berm along the alignment of the existing loop road which directs drainage toward Lot D and into the upper most reach of Bright Angel Wash. This berm was not proposed in the Phase 1 drainage analysis and, as a result, creates a slight modification to the North subbasin boundaries and flow paths as shown on Figure 2.

Hydrologic calculations for the North subbasins (PN1, PN2 and PN3) were updated and compared to the original Phase 1 calculations. Although additional area (0.7 acres) was shifted to subbasin PN3, the runoff peak for PN3 essentially remains the same as the flow path length increases. Runoff peaks from subbasins PN1 and PN2 also essentially remain the same as the decrease in area is offset by the slight decrease in flow path length.

3.0 Conclusions

The proposed culverts, flow spreaders and ponds associated with the North subbasins are not impacted by the slight changes in runoff peaks. Due to the relatively minor drainage from Lot D and the adjacent areas, flow spreaders or other specialized conveyance measures are not required. However, there may be a need for detailed grading, stone work and/or other landscaping features to convey the minor drainage from the Lot D area into Bright Angel Wash.



CVIP AND MATHER POINT IMPROVEMENTS
PROPOSED DRAINAGE PLAN w/ PHASE 2 SUBBASINS

DATE	JUNE 2009
FIGURE	F-2